11/30/17

"Remember no one can make you feel inferior without your consent."-Eleanor Roosevelt

HW: "Implicit Differentiation" w/s #1-6

AIM: How do we do Implicit Differentiation?

Warm-up:

Find $\frac{dy}{dx}$ for each of the following:

1) $y = 3x+5$

$\frac{dy}{dx} = 3$

2) $xy=5$

$y = \frac{5}{x} = 5x^{-1}$

$\frac{dy}{dx} = -5x^{-2}$

$\frac{dy}{dx} = \frac{-5}{x^2}$

For these, y is a function explicitly defined in terms of x.

$y=3x^2+2x$

$y=x+1$

$y=\sin x$

$y=\sqrt{x^2+2}$

For these, y is a function implicitly defined in terms of x.

$xy=12$

$3x^2y+2y^2-5=0$

$x+xy+y=5$

$y=\cos xy$

Be able to explain what makes a function implicitly defined vs. explicitly defined.

Y is "mixed in with x

Y is alone

$\frac{dy}{dx}$ = "Derivative of y with respect to x"

Implicit Differentiation

ex. $\frac{d}{dx}[y] =$ $\frac{dy}{dx}$

$\frac{d}{dx}[x^2] = 2x$

ex. $\frac{d}{dx}[2y] =$ $2\frac{dy}{dx}$ Think $\frac{d}{dx}[2x] = 2$

ex. $\frac{d}{dx}[y^2] =$ $2y\frac{dy}{dx}$ Think $\frac{d}{dx}[x^2] = 2x$

Implicit Differentiation

Take the derivative of each term with respect to x and solve for dy/dx.

ex. Find dy/dx for $y^2+3x=x^2$

$$2y\frac{dy}{dx}+3=2x$$

$$-3 \quad -3$$

$$\frac{2y\frac{dy}{dx}}{2y}=\frac{2x-3}{2y}$$

$$\frac{dy}{dx}=\frac{2x-3}{2y}$$

ex. Find dy/dx for $\sin x + \cos y = 2y$

$$\cos x - \sin(y)\frac{dy}{dx} = 2\frac{dy}{dx}$$

$$+\sin(y)\frac{dy}{dx} \quad +\sin(y)\frac{dy}{dx}$$

$$\cos x = 2\frac{dy}{dx} + \sin(y)\frac{dy}{dx}$$

$$\frac{\cos x}{2+\sin y} = \frac{\frac{dy}{dx}(2+\sin(y))}{2+\sin(y)}$$

$$\frac{dy}{dx} = \frac{\cos x}{2+\sin y}$$

ex. Find dy/dx for $y^2 + xy + x^2 = 5$ (product)

$$2y\frac{dy}{dx} + x\frac{dy}{dx} + 1y + 2x = 0$$

$$-1y \quad -2x \quad -1y - 2x$$

$$2y\frac{dy}{dx} + x\frac{dy}{dx} = -y - 2x$$

$$\frac{\frac{dy}{dx}(2y+x)}{2y+x} = \frac{-y-2x}{2y+x}$$

$$\frac{dy}{dx} = \frac{-y-2x}{2y+x}$$